

IN THE CLAIMS

WHAT IS CLAIMED IS:

1. (Currently Amended) A method of fabricating a compositionally modulated electrode in a magnetic tunnel junction device, comprising:
  - depositing a mask layer on a surface of a previously fabricated homogeneous electrode of the magnetic tunnel junction device, the electrode device including a first resistivity and overhanging the magnetic tunnel junction;
  - patterning a plasma mask in the mask layer;
  - forming the plasma mask in the mask layer so that a portion of the surface is exposed by the plasma mask;
  - forming a high resistivity region that extends inward of the surface by exposing the portion of the surface to a plasma process selected from the group consisting of a plasma oxidation process, a plasma nitridation process, and a plasma carburization process, the high resistivity region including a second resistivity that is higher than the first resistivity; and
  - removing the plasma mask from the surface of the electrode to expose a homogeneous electrode having a region of high resistivity adjacent to at least one region of first resistivity.
2. (Original) The method as set forth in Claim 1 and further comprising:
  - continuing the forming of the high resistivity region until the high resistivity region extends inward of the surface by a predetermined depth.
3. (Original) The method as set forth in Claim 1, wherein the plasma oxidation process comprises a gas plasma including a carrier gas comprising oxygen.
4. (Original) The method as set forth in Claim 1, wherein the plasma nitridation process comprises a gas plasma including a carrier gas comprising nitrogen.
5. (Original) The method as set forth in Claim 1, wherein the plasma carburization process comprises a gas plasma including a carrier gas comprising carbon.
6. (Original) The method as set forth in Claim 1, wherein the forming the plasma mask comprises a process selected from the group consisting of etching the mask layer and developing the mask layer.
7. (Original) The method as set forth in Claim 1, wherein the mask layer comprises a photoresist material.
8. (Original) The method as set forth in Claim 1 and further comprising:

continuing the forming of the high resistivity region until the second resistivity of the high resistivity region reaches a predetermined value of resistivity.

9. – 21. (Canceled)
22. (New) The method as set forth in Claim 1, wherein the method conditions at least one portions of the electrode to provide the region of high resistivity, the electrode remaining a unitary conductor.
23. (New) The method as set forth in Claim 1, wherein the region of high resistivity is aligned to the magnetic tunnel junction device, the at least one region of first resistivity offset from the magnetic tunnel junction device.
24. (New) The method as set forth in Claim 1, wherein the homogeneous electrode is composed of a single metal or an alloy.
25. (New) A method of fabricating a compositionally modulated electrode spanning a plurality of magnetic tunnel junction devices, comprising:
- depositing a mask layer on a surface of a previously fabricated electrode spanning a plurality of spaced apart magnetic tunnel junction stacks, the electrode including a first resistivity;
  - patterning a plasma mask in the mask layer;
  - forming the plasma mask in the mask layer so that a plurality of portions of the surface are exposed by the plasma mask, each exposed portion aligned to a tunnel junction stack;
  - forming a high resistivity region that extends inward of the surface by exposing the portions of the surface to a plasma process selected from the group consisting of a plasma oxidation process, a plasma nitridation process, and a plasma carburization process, the high resistivity regions including a second resistivity that is higher than the first resistivity; and
  - removing the plasma mask from the surface of the electrode to expose a homogeneous electrode having disposed therein a plurality of regions of high resistivity interspersed between regions of first resistivity.
26. (New) The method as set forth in Claim 25, wherein the regions of high resistivity are aligned to the magnetic tunnel junction stacks, the regions of first resistivity aligned between the magnetic tunnel junction stacks.

27. (New) The method as set forth in Claim 25, wherein the electrode is a homogeneous electrode having disposed therein regions of high resistivity interspaced with regions of first resistivity.
28. (New) The method as set forth in Claim 25, wherein the method conditions existing portions of the electrode to provide regions of high resistivity, the electrode remaining a unitary conductor.
29. (New) The method as set forth in Claim 25, wherein the electrode is composed of a single metal or an alloy.
30. (New) The method as set forth in Claim 25 and further comprising:  
continuing the forming of the high resistivity region until the high resistivity region extends inward of the surface by a predetermined depth.
31. (New) The method as set forth in Claim 25, wherein the mask layer comprises a photoresist material.
32. (New) The method as set forth in Claim 25 and further comprising:  
continuing the forming of the high resistivity region until the second resistivity of the high resistivity region reaches a predetermined value of resistivity.